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ABSTRACT

In this paper it is argued that there are fundamental differences among labor markets in the mechanisms that create the observed associations between socioeconomic attainment and the characteristics of individuals, and that these differences result from the nature of the employment relationship in different labor markets. In open-employment relationships, which predominate in secondary labor markets, employees are exposed to competition from other workers, and marginal productivity/human capital theory applies. In closed-employment relationships, which characterize primary labor markets, employees are protected from competition, and change in attainment takes place when employees obtain access to vacant jobs better than their current job. Evidence for different types of employment relationships in different labor markets is obtained from an analysis of job shifts using life history data on white men aged 30-39 in 1969. This analysis focuses on the transition rates to better and worse jobs as a function of personal resources, current job rewards, and the type of employment relationship. (Author/GC)

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LABOR MARKET STRUCTURES AND JOB MOBILITY

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LABOR MARKET STRUCTURES AND JOB MOBILITY

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ABSTRACT

In this paper we argue that there are fundamental differences among labor markets in the mechanisms that create the observed associations between socioeconomic attainment and the characteristics of individuals, and that these differences result from the nature of the employment relationship in different labor markets. In open-employment relationships, which predominate in secondary labor markets, employees are exposed to competition from other workers, and marginal productivity/human capital theory applies. In closed-employment relationships, which characterize primary labor markets, employees are protected from competition, and change in attainment takes place when employees obtain access to vacant jobs better than their current job. Evidence for different types of employment relationships in different labor markets is obtained from an analysis of job shifts using life history data on white men aged 30-39 in 1969. This analysis focuses on the transition rates to better and worse jobs as a function of personal resources, current job rewards, and the type of employment relationship.

INTRODUCTION

Sociological research on socioeconomic attainment has predominantly focused on differences in attainment associated with characteristics of individuals, e.g., their family background, education, sex, and race. Recently there has been a growing interest in differences in attainment associated with the occupational-industrial structure (e.g., Bibb and Form, 1977; Stolzenberg, 1975a; Spilerman, 1977; and much unpublished research). The latter literature integrates ideas and concepts from a number of areas--institutional economics, organizational theory, industrial and occupational sociology--with the approach that Blau and Duncan (1967) originated. The main thrust of the argument in this literature is that the setting--the labor market--influences the outcome of the attainment process by capturing sources of inequality that either add to or interact with individual variables relevant for attainment.

There are several theoretical approaches and also some empirical research supporting this argument. Institutional and radical economists provide a number of typologies of labor markets--among others, primary and secondary markets (Doeringer and Piore, 1971); external and internal markets (Kerr, 1954; Doeringer and Piore, 1971); center (core), periphery and irregular sectors (Averitt, 1968; Bluestone, 1970); monopoly and competitive sectors (Gordon, 1972; O'Connor, 1973); wage and job competition sectors (Thurow, 1975). These typologies presumably capture characteristics of industries, firms, and jobs that should affect employment patterns and the attainment of persons. The literature in this framework usually can demonstrate that such differences exist, but the reasons for the differences are not altogether clear or agreed upon. Furthermore, the

operationalization of the various typologies is ambiguous. Often individual characteristics, particularly sex and race, are used to identify markets (for example, see Doeringer and Piore, 1971; Leigh, 1976), though this confounds the structure with outcomes produced by it.

The (neo) institutional and radical economic approaches to identifying labor markets have opposed orthodox economic labor market theory, which assumes there is a single competitive labor market, though allowing for some "imperfections" in reality. Spokesmen for the orthodox theory have responded to this challenge by pointing to methodological problems in the research on segmented labor markets, by emphasizing the distinction between short-term and long-term patterns and by noting other deviations of reality from theoretical assumptions. But most importantly they have pointed out that the challengers have failed to provide an alternative analytic theory equally powerful to the orthodox theory (Cain, 1976). This latter criticism would not be accepted by all, particularly those working within a radical (Marxist) framework. Nevertheless, it is often unclear why different segments in these various typologies produce different patterns of attainment. A possible exception is Thurow's job competition model, but it is unclear how to translate his conceptualization into empirical observables.[1]

Another approach is exemplified by sociological research exploring differences in earnings attainment patterns (Stolzenberg, 1975a,b) and career patterns (Spilerman, 1977) by occupation-industry categories. No typology is proposed in this research, consistent with the inductive tradition in sociological research on attainment. It is observed that labor markets seem to be segmented along occupational-industrial lines (Stolzenberg, 1975a) and that career lines (indicated by earnings

trajectories) depend on the occupational-industrial point of entry that launches an individual on a career (Spilerman, 1977). This research shows clearly that something about occupational-industry categories makes a difference, and the results sometimes suggest hypotheses about the sources of these differences. However, there is little attempt in the sociological research on attainment to formulate a systematic, analytic theory accounting for the various patterns.[2]

We have, then, a continuum. At one end is orthodox economic theory, which assumes a single labor market (at best imperfectly approximated in reality). At the other end is sociological research, which is mostly concerned with observing the attainment process in different settings among different populations. In between are segmented labor market theories that suggest numerous, but poorly integrated hypotheses about basic differences among two or three labor markets.

By themselves empirical observations on the attainment process in different settings are not likely to settle the issue of whether there is one labor market (as assumed in the orthodox theory), two or three markets (as suggested by segmented labor market theories) or as many markets as occupation-industry categories (as implied by the sociological research). Some conception of the crucial dimensions along which markets vary is necessary to interpret observed differences. This conception should be derived from a theory of the attainment process.

Two tasks are involved in specifying a theory of this process. One is to specify the mechanisms for change in attainment, that is, how change is brought about. The other is to specify the causal influences transmitted by these mechanisms. Research on labor markets has been dominated by the

latter task, for example, by testing hypotheses regarding differences in the effect of (returns to) education in different markets. However, the first task is the more fundamental one. The specification of the mechanism of change generates the functional form of the attainment model. So parameters in a model (e.g., the effects of causal variables) derive their interpretation from this specification. Hence, if labor markets differ in the mechanisms of change, different attainment models and different interpretations of parameters follow. Moreover, the specification of the mechanisms of change in the processes of interest determines what evidence should be obtained, as well as how it is to be interpreted. Misspecification resulting from inattention to this issue leads to ambiguous evidence at best. The continuing controversies regarding the nature of labor markets support this statement (see Cain, 1976).

In this paper we argue that labor markets differ fundamentally with respect to the mechanism of change in attainment. We claim that the source of the difference resides in the nature of the employment relationship, specifically in the relative bargaining power of employers and employees over access to jobs by outsiders. This aspect of the employment relationship determines the degree to which the job holder is insulated from competing with others for his job, which in turn determines how change in attainment occurs, and hence how social and economic inequality is created.

The conceptual part of the paper leads to formulation of a basic distinction between open and closed employment relationships, where by closed employment relationships we mean jobs in which incumbents are insulated from competition by outsiders.[3] We provide empirical evidence for this distinction from an analysis of rates of job shifts. In closed-

employment relationships job shifts are initiated by the incumbents of jobs, except in exceptional circumstances (e.g., business failure). In open-employment relationships shifts can be initiated by the employer (reflecting shifts in the demand for and supply of labor) or by the employee. This distinction suggests a number of hypotheses concerning the mechanisms which govern transition rates to better and worse jobs; some of these are specified below and tested in the empirical analysis of job shifts.

The empirical analysis relies on job history data from the Johns Hopkins Life History Study. These data are event histories, which give information on both the timing of job changes and the sequence of job types held by each individual in his career, and they provide an unusually rich source of information on processes of change. The efficient use of such information demands estimation techniques for continuous time models in which parameters depend on individual and job characteristics, and possibly also on time. A maximum likelihood estimation technique developed by Tuma allows us to carry out such analysis. The technique is described in detail elsewhere (Tuma et al., in press).

The objective of this paper is to establish evidence for the proposed differences in mechanisms of attainment in different labor markets. The task of identifying the boundaries of actual markets is not attempted. Nor do we attempt to analyze differences in attainment resulting from the different mechanisms. These tasks are carried out in some current research (Sørensen, 1978) and also planned for future research.

1. OPEN AND CLOSED EMPLOYMENT RELATIONS

We argued above that the existence of differences in attainment in different labor markets can be explained by differences in the mechanisms

for change in attainment as well as differences in causal influences transmitted by these mechanisms. In this section we identify the different mechanisms for change alluded to in the introduction and describe conditions under which they are likely to emerge.

Outcomes of the attainment process are social and economic rewards obtained in jobs by persons endowed with certain relevant resources such as education, ability, race, and family background. There is a well-known and much described association between individual resources and the social and economic rewards. How is this association created?

Orthodox economic theory provides one answer. In this theory rewards (earnings) are assumed to be determined by the intersection of the labor supplied by individuals and the labor demanded by firms, where labor demand reflects in turn the demand for the firm's output. Marginal productivity theory predicts that earnings of persons are a function of their productivity, the prices for the firm's output, and the costs of the other factors of production. Differences in productivity among persons, and hence differences in earnings, reflect differences in ability, training and experience. Human capital theory accounts for training differences, and explains unequal earnings as differential compensation for training costs.

The orthodox theory assumes a competitive market for labor that has the same properties as markets for all other goods. This market ties the earnings of persons to their productivity. For a given demand for labor, a person's earnings change if and only if his productivity changes. Training on the job and experience are the main source of such changes after entry into the labor market. Additions to a person's resources account for growth in attainment that is rapid in the younger years and gradually tapers

off. The initial endowment of productivity is determined primarily by a person's education. In this way, human-capital theory explains both the effect of education on attainment and the age-earnings profiles commonly observed.

Differences in derived (or actual) demand for labor in different parts of the labor market also produce earning differentials and unequal returns to aspects of human capital. However, in a competitive market such differences act as signals generating movements of labor that eliminate the differential in the long run.

Much of the literature on segmented labor markets is a critique of this feature of the orthodox theory. It is argued that demand differentials are not eliminated, because there are barriers to mobility between labor market segments. These barriers are especially likely to capture minorities and women in markets associated with lower attainment and lower returns to resources. Hence, it is argued that the labor market is imperfect, but the basic demand and supply mechanisms generating attainment operate within each segment. So the literature on segmented labor markets does not depart from the basic economic assumptions about the mechanisms generating inequality.

One kind of departure from basic assumptions would identify those properties of labor markets that result in attainment not being tied directly to the productivity of persons. For example, the existence of uncertainty concerning the productivity of labor violates the assumption of perfect information in orthodox theory. Several proposals along these lines have been made within a neo-classical economic framework (Arrow, 1972; Spence, 1974); these suggest that screening and signaling mechanisms are responsible

for the effect of education on attainment. However, these proposals have not provided alternative explanations for other features of the attainment process, in particular the age-earnings profiles.

Another property of actual labor markets seems an equally, if not more, likely source of differences in attainment. Orthodox theory assumes that labor markets function much like markets for other goods. This implies that labor shares characteristics of other goods. Among these characteristics (see Sørensen and Kalleberg, 1977, for an elaboration), one invites particular scrutiny. When ordinary goods are sold, the seller completely relinquishes control over the good to the buyer, who can dispose of it as he pleases. In the case of labor, this means that the employer should be able to dispose of the labor supplied as he pleases, which means as dictated by his desire to achieve optimally efficient production. This may seem to imply that the employer has complete control over an employee's activities. Since, according to the theory, however, wage rates reflect productivity, such control is unnecessary in principle: the market guarantees that everyone supplies the quantity and quality of labor for which he is paid.

What is crucial, however, is the employer's control over the length of the employment contract. For the market to reveal productivity differences, employees must compete for wages. An employer at any moment should be able to replace an employee with someone else if the other person is willing to be equally productive at a lower wage rate, or more productive at the current wage rate. In other words, the labor market only functions as a goods market if the employment relationships is completely open, that is, if access to a job is completely controlled by the employer regardless of the wishes of the incumbent.

In contrast, if the employment relationship is closed, no one can get access to the job unless the present incumbent dies or chooses to leave--for a better job, or for retirement. Then the employment relationship is insulated from competition with others. With this insulation, earnings are likely to become attributes of jobs rather than of persons (for an elaboration of this argument see Thurow, 1975; and Sørensen and Kalleberg, 1977). Other job rewards, such as occupational prestige and desirable work conditions, are clearly always characteristics of jobs. Consequently, in a closed-employment relationship a change in attainment takes place when there is a vacancy in a better job. In an open-employment relationship, changes in some aspects of attainment, such as prestige and satisfaction, may also require a job shift. However, vacancies are not needed to get access to an open-employment relationship--the individual can obtain access by offering to work at a lower wage rate than the incumbent, or by being more productive at the same wage. Most importantly, a change in earnings need not take place through a job shift, since the wage rate reflects marginal productivity. Hence we refer to the attainment process in open-employment relationships as wage competition.

There are several sources of closed-employment relationships. In general, a source may be anything that provides the employee with bargaining power vis-à-vis the employer. One source of closed-employment relationships is the existence of on-the-job training. Training is important when it involves the acquisition of specific skills that the employer subsidizes because the skills are not transferable elsewhere (Becker, 1964). Training is an investment on the part of the employer that provides the trainee with bargaining power. Moreover, since coworkers often provide on-the-job training, they must be given job security in order for them to be willing

to train otherwise potential competitors (Thurow, 1975).

There are other sources of closed-employment relationships. Collective action resulting in unionization is also an obvious source of bargaining power in individual employment relationships. Furthermore, individual productivity on many tasks is difficult to assess and regulate: administrative tasks are one example; the contribution of single workers in interdependent production systems is another. The resulting uncertainty is likely to lead to closed-employment relationships.

In a closed-employment relationship the market cannot enforce the relation between productivity and wages. Hence, regulation of effort becomes an important concern of the employer. Job ladders and promotion schedules may be regarded as motivational devices that reduce the need for frequent and close supervision and its associated costs. For such schemes to be effective they should not provide outsiders with access to jobs other than entry jobs. Hence promotion schedules are likely to be associated with closed employment relationships and to reinforce the insulation of employees to competition from the outside.

The creation of vacancies in closed-employment relationships represents opportunities for others to change their attainment. The timing of such vacancies and the timing of changes in people's productivity are not necessarily related. Hence, in closed-employment relationships, change in attainment need not immediately accompany a change in personal resources, contrary to the basic assumption of orthodox economic theory. Since the basic mechanism for change in attainment is the creation of vacancies, there is competition over access to vacancies in better jobs. Hence, we refer to the attainment process in closed-employment relationships as

vacancy competition.

In vacancy competition, personal resources such as background, education, and ability are relevant for attainment because they determine which candidate among those available gets access to a vacancy. Because employers cannot control the length of the employment relationship, they will wish to employ the candidate expected to display the most satisfactory performance. So the level of a person's resources relative to those of other candidates becomes crucial for access to a job. This contrasts with the case described by orthodox theory, in which the absolute level of resources determines productivity, and hence attainment. The different role of resources in vacancy competition and in wage competition has important implications for the role of education in the attainment process. In the former, education is assumed to confer productive skills; in the latter, education serves as a ranking criterion in the allocation of persons to jobs. Furthermore, in vacancy competition education and other resources formed prior to entry into the labor force continue to influence attainment; hence, growth in attainment need not result from growth in productive skills.

A mathematical model of attainment when there is vacancy competition is derived in Sørensen (1977a). This model implies the basic observed features of the attainment process--in particular, the usual age-attainment profile. Thus interpretations of the attainment process other than those of the orthodox theory may be plausible. However, the similar predictions of the two theories also make it difficult to discriminate between them through direct research on outcomes of the attainment process at a point in time.

Job shifts play a central role in the vacancy competition model, since they are the basic vehicle of change in attainment. In the marginal productivity/human capital theory, job shifts are not the basic mechanism of change in earnings (though they are the mechanism of change in prestige and working conditions). The basic mechanism of change in earnings is a change in labor supplied or demanded. This suggests the need to obtain evidence on the relation between the nature of the employment relationships and job shifts.

2. THE RATE OF JOB SHIFT AND MECHANISMS OF ATTAINMENT

Before we specify the basic hypotheses of this paper, it is useful to give a precise formulation of the dependent variable in the investigation: the rate of job shift.

Modeling Rates

The events of interest to us--job shifts--occur randomly in time. This suggests using a continuous-time stochastic model to describe the occurrence of job shifts and the sequence of jobs in a person's career.

In the remainder of the paper the symbol t denotes a moment in real time. Here u refers to some earlier time, $u \leq t$. Let j and k represent any two jobs, and $p_{jk}(u,t)$ represent the probability that someone in job j at time u occupies job k at time t. The rate of a shift from job j to job k is defined as the limit, as Δt approaches zero, of the probability of a change from j to k between t and $t+\Delta t$, per unit of time:

$$r_{jk}(t) = \lim_{\Delta t \to 0} \frac{p_{jk}(t,t+\Delta t)}{\Delta t} , \quad j \neq k . \qquad (1)$$

If we sum over all possible destinations k, we have a definition of the rate of leaving job j, $r_j(t) = \sum_k r_{jk}(t)$. Suppose the person entered job j at time t_j. Then it can be shown that:

$$r(t|t_j) = \frac{\frac{dF(t|t_j)}{dt}}{1-F(t|t_j)} \qquad (2)$$

where $F(t|t_j)$ = Pr (a person who began his job j at time t_j leaves the job before t) and $F(t|t_j) = 0$ for $t < t_j$. Equation (1) is a differential equation with solution:

$$F(t|t_j) = 1 - \exp\left[-\int_{t_j}^{t} r_j(u|t_j)du\right] \qquad (3)$$

Equation (3) shows that specifying the rate $r(t|t_j)$ serves to specify the probability that a person leaves his job before time t, given that the job was entered at time t_j. Different specifications of the rate result in different stochastic models of job mobility. Most simply, the rate may be assumed to be the same time-dependent constant r for all job-person matches. Then the Poisson distribution describes the number of shifts in a certain period of time, and the exponential distribution describes the waiting time between shifts or the completed duration of jobs. Both distributions are governed by the constant rate r.

Jobs may be classified into states (say, occupations). Rather than focusing on the overall rate at which jobs are left, we may focus on the rate of moving from a job in one state to another. The quantities that govern such moves are the $r_{jk}(t)$'s defined above. The simple continuous-time Markov model of job mobility results from assuming the Markov property

and that these rates do not vary over time, i.e., $r_{jk}(t) = r_{jk}$. This is an important baseline model in the analysis that follows.

The various stochastic process models described above rarely, if ever, accurately describe social processes. The lack of empirical fit has two sources. One is the likely variation of parameters among individuals (or other units of analysis). The other is time-dependency in the parameters. There are numerous proposals for improving empirical adequacy by modifying the simple models to take into account heterogeneity in rates among individuals and/or time-dependence in rates. We expect to find both heterogeneity and time-dependence in rates of job shifts. In fact, rather than seeing heterogeneity and time-dependence as nuisances to be overcome, we capitalize on these departures from the assumptions of standard models to pursue our substantive objectives. That is, by modeling and estimating heterogeneity and time-dependence, we hope to show the existence of different mechanisms of attainment through estimates of the rates of job shifts in different types of jobs.

We use a model for the dependence of rates on variables characterizing origin jobs j, destination jobs k, individuals i and time t of the general form:

$$r_{ijk}(t|t_j) = g(\underline{X}_i, \underline{Y}_j, \underline{Y}_k, T_j, d_j) \qquad (4)$$

where $\underline{X}_i$ is the vector of variables measuring individual i's resources, $\underline{Y}_j$ and $\underline{Y}_k$ are vectors of variables describing rewards obtained from jobs j and k (respectively), T_j is time in the labor force at entry to job j, and d_j is duration in job j. The exact form of the models and methods of

estimating and testing them are discussed below.

In using the Markov model as a framework for the analysis we are assuming that the process lacks a "memory" of the past. The validity of this assumption in empirical applications is often considered a serious problem. However, this assumption applies net of the variables introduced in the specification of (4). History may be captured by these variables. Hence we believe that the Markov model is an appropriate model to choose as a framework for our analysis.

Hypotheses

Characteristics of closed- and open-employment relationships may be used to formulate a number of hypotheses about the relation between the employment relationship and the rate and direction of a job shift. If people try to maximize job rewards, a job shift initiated by an employee should produce a gain in job rewards. So in closed jobs the incumbent should leave a job only when a better job is available. Moreover, the incumbent can wait in his present job until a better job appears. Better jobs become vacant randomly over time at a certain rate. A person's ability to obtain access to jobs depends on his resources, and whether these jobs are "better" depends on the rewards of his present job. The higher his resources relative to the current job rewards, the more likely he will get access to a better job when it becomes vacant.[4] Hence we should be able to predict the occurrence of job shifts in closed-employment relationships from information on current job rewards and resources of persons, both of which we can measure, as described later.

If the labor market conforms to the scenario assumed in the orthodox economic theory, very little can be said about the occurrence of shifts

in open-employment relationships. In a perfectly competitive market in equilibrium everyone gets job rewards commensurate with personal resources. A change in resources, which results in increased productivity, produces a change in rewards. The reward focused upon in the competitive theory is a person's wage rate, and this may change within jobs. In such a system job shifts have very little to do with earnings attainment, and little can be said about the relationship between job shifts, personal resources, and job rewards. The continuous adjustment to equilibrium that presumably takes place produces expansions and contractions of the labor force in individual firms, but the occurrence of job shifts resulting from such changes in production cannot be predicted from personal resources or job rewards.

If the competitive market is imperfectly approximated in reality, as everyone would admit, then something may be said about the occurrence of shifts in open-employment relationships. The relevant aspects of imperfection are that there are lags in the adjustment to changes in labor supplied and demanded, and that people also desire nonpecuniary job rewards. This means that even in open-employment relationships some have a lower wage rate than they could obtain elsewhere for their resources, and that some have a wage rate that is "too high" for their resources--meaning that someone else with higher resources might be willing to accept the same job at that wage rate. In the former case, upward moves should occur, just as in closed-employment relationships. In the latter case, the employer should dismiss the current incumbent or induce him to quit (for example, by lowering his real wage rate). The timing of such dismissals need not coincide with the availability of

better jobs. So, in open-employment relationships, where incumbents are not insulated from competition, we expect that there should be job shifts leading to both gains and losses in attainment. This contrasts with the situation in closed relationships, where employer-initiated dismissals, and hence losses in attainment, should be rare.[5]

In sum, we expect closed employment to produce mainly upward moves, and open jobs to produce both upward and downward moves. Further, we expect outcomes of moves to be less predictable in open than in closed jobs. Below we present a causal analysis of the rate of upward and downward moves using information on shifts from all jobs. This analysis should provide information on the mechanisms that govern downward moves, because these are likely to originate in open jobs. However, we cannot use this analysis to draw unambiguous inferences on the mechanisms generating upward moves, since these can occur in open-employment relationships (as well as in closed ones) because of market imperfections.

We need a direct indicator of the degree of openness of the employment relationship to validate whatever inferences may be drawn from the analysis of all job shifts. Only a crude indicator is available, as we describe below. Much of the analysis that follows would have been unnecessary if we could measure directly the openness of the employment relationship. As it is, a main task is to provide indirect evidence on the existence of open- and closed-employment relationships.

3. RESEARCH METHODS

Data

We use data collected in the Johns Hopkins Life History Study. This study was initiated by James S. Coleman and Peter H. Rossi; it dealt with

the occupational, educational, familial, and residential experiences of respondents from age 14 to the time of the 1969 interview (Blum et al., 1969).

The universe is the total population of males aged 30-39 residing in the United States in 1968. Two samples were drawn: (a) a national sample and (b) a supplementary sample of blacks. The total number of completed interviews was 1589: 738 blacks and 851 whites. The completion rates were 76.1% for sample (a) and 78.2% for sample (b).

A total of 2295 job-person matches are used in the analysis reported below. This represents a 50% random sample of the jobs held by the 856 white respondents for whom there is complete information on the variables used in our analysis. The analysis excludes jobs held before entry into the labor force, which is defined to occur when full-time employment lasts 18 months or more. Spells of unemployment and military service are also excluded, as our arguments do not pertain to them. Our analysis excludes blacks, though the topic is of great interest; black-white comparisons will be reported in another paper.

Our analysis uses information on the variables listed in Table 1. Information on several other job and person characteristics is available, but is ignored because it seems less salient for the issues addressed in this paper. This list omits some variables that would have been highly relevant for the analysis in this paper. We do not have information on market conditions of the firms in which the jobs were held, though in open-employment relationships these market conditions should have a major effect on the rate of job shift. We also do not have information on direct measures of increases in personal resources obtained as a result of on-the-job training and the like. In this respect our situation resembles the situation in most other empirical research.

More importantly, we have only crude indicators of the degree of openness of the employment relationship. One is the time unit of earnings reported by the respondent, i.e., whether earnings were reported in dollars per hour, day, week, month, or year. The other is union membership. We claim that a longer time unit usually indicates a more closed employment relationship. This measure is very rough: even in very secure blue-collar employment, the time unit may still be hourly or weekly because of tradition. Here we hope that unionization may differentiate further. In future work we hope to develop another indicator using data on occupation and industry categories with information from other sources on characteristics of these categories.

Specification of Models

There are numerous alternative ways of formulating the models of rates. The particular ones we used are described below. Their usefulness is established in an analysis of shifts from all jobs. The most promising of these is then applied in an analysis of shifts in the sectors chosen to indicate the type of employment relationship.

In the specification of the vacancy competition (closed employment) model presented in Sørensen (1977a), a very simple relationship between time in the labor force and the rate of a job shift is derived. (Because employment is closed, only upward shifts occur.) It is:

$$r_{jk}(t) = e^{bT} \qquad b < 0 \tag{5}$$

where T is the length of time in the labor force and rewards of job k are greater than those of job j (i.e., $Y_k > Y_j$).

This derivation assumes that job rewards are exponentially distributed with parameter β; consequently, the structure of inequality is shaped like

a pyramid. The single parameter β governs the distribution of rewards and determines the proportion of jobs better than any given job. It is also assumed that new vacancies at all levels are created at a constant rate h. These vacancies generate chains of moves from one attainment level to the next higher one. It is then shown that the rate at which better jobs become available is the same at all attainment levels, and that this rate depends only on β and h. A person's ability to obtain access to a better job depends on the amount of time in the labor force, T, since a person gets closer and closer to his best possible job as T increases. From this formulation (5) follows, where $b = \beta/h$. Thus b measures the opportunity structure of the society.

In the vacancy competition (closed-employment) model, T is an index of the discrepancy between personal resources and current job rewards. In empirical investigations of the human capital (open-employment) model, T is used as a proxy measure of resources acquired after entry into the labor force, which are assumed in this theory to govern gains in attainment (see Mincer, 1974). In the latter interpretation, b in (5) measures the effect of increases in resources on the rate of shifts. Thus the human capital model predicts that the rate of upward moves increases with T and that the rate of downward moves decreases with T.[6] The vacancy competition (closed-employment) model, of course, makes no prediction about the rate of downward moves, because these are expected to occur very rarely in closed-employment relationships.

We use a slight generalization of (5) as our point of departure in the empirical analysis. The effect of T confounds the effect of time in the labor force with the effect of duration on the job, because $T = T_j + d_j$, where as before T_j is labor force experience when job j is

entered and d_j is duration in job j. Hence we use T_j rather than T as Model I in our analysis:

$$r_{jk}(t) = \exp(b_0 + b_1 T_j) \tag{6}$$

Figure 1 illustrates the pattern of variation in rates over a person's career generated by this model and by other models specified below.

In closed-employment relationships the discrepancy between resources and current job rewards generates all shifts, as argued earlier. In open jobs with market imperfections a similar prediction can be made. This suggests estimating Model II of our analysis (see Figure 1):

$$r_{jk}(t) = \exp(\underline{\alpha}_1 \underline{X} + \underline{\alpha}_2 \underline{Y}_j) \tag{7}$$

where $\underline{X}_i$ is a vector of variables describing resources of person i and $\underline{Y}_j$ is a vector of variables measuring rewards in the current job j. The quantities $\underline{\alpha}_1$ and $\underline{\alpha}_2$ are vectors of coefficients corresponding to these variables. We expect that in upward shifts ($Y_k > Y_j$) the coefficients of $\underline{X}_i$ are positive and those of $\underline{Y}_j$ are negative. For downward shifts ($Y_k > Y_j$), we expect exactly the opposite signs. A similar argument has been elaborated by Tuma (1976).

We also estimate Model III, a slight modification, that includes labor force experience T_j as well as $\underline{X}_i$ and $\underline{Y}_j$ (see Figure 1):

$$r_{jk}(t) = \exp(\underline{\alpha}_1 \underline{X}_1 + \underline{\alpha}_2 \underline{Y}_j + b_1 T_j) \tag{8}$$

This model permits a preliminary test of whether the effect of T_j in (6) comes about because T_j is an index of the discrepancy between rewards and

resources (those formed before entry into the labor force) or because T_j measures increments to resources gained since labor force entry. The former interpretation is consistent with the vacancy competition (closed-employment) model, while the latter is implied by the human capital (open-employment) theory.

For a conclusive evaluation of these issues we need to include duration in job j, d_j. Duration-dependence in rates of job shifts has been empirically established by Tuma (1976) in an analysis using a model similar to the one that we apply here. There are numerous interpretations that may be given to duration-dependence.

One hypothesis is that there is "cumulative inertia"; that is, that the rate of leaving jobs declines for everyone as duration increases (McGinnis, 1968). A more specific rationale for genuine duration-dependence is job-specific training--training not rewarded in other jobs (Tuma, 1976). Such training may transform an initially open relationship into a closed one.

It is well known that time-dependence of rates is easily confounded with heterogeneity in rates (see, for example, Ginsberg, 1971). Hence to assess genuine time-dependence we need to control for heterogeneity. Controlling for the resource and reward variables in (7) and (8) removes only some of the relevant heterogeneity. There is also heterogeneity due to the employment relationship. In analyzing the rate of downward moves there may be time-dependence because some jobs are closed to competition and therefore have very low rates of downward moves, while others are open and hence have higher rates of downward moves. For this reason we expect duration-dependence of the rate of downward moves to be especially pronounced.

All of the various mechanisms mentioned so far suggest that the rate of a move declines with the duration in the job. There are also arguments for positive duration effects, especially in upward moves. If on-the-job training is not specific to the current job--that is, if some of the skills acquired are transferable to other jobs--the rate of an upward move may increase with duration in the job. If people search for opportunities for better jobs continuously, but their aspiration level falls as the search lengthens, then the rate of an upward move should also increase as duration in the job increases. The latter argument has been formulated for the duration of unemployment spells (see Holt, 1970), but it is plausible to generalize this argument to job search for employed persons too.

In upward moves, positive and negative duration-dependence are likely to be confounded, while in downward moves the mechanisms that produce negative duration-dependence should prevail. We do not attempt to disentangle the various interpretations completely. However, we do attempt to reduce the degree to which duration-dependence reflects heterogeneity in personal resources and job rewards by estimating Model IV (see Figure 1):

$$r_{jk}(t) = \exp(\underline{\alpha}_1\underline{X}_i + \underline{\alpha}_2\underline{Y}_j + b_1T_j + \gamma d_j) \quad . \tag{9}$$

Estimation

The coefficients of variables are estimated by the method of maximum likelihood (see Tuma et al., in press). With this method we can use a likelihood-ratio statistic to test the statistical significance of a particular specification of (4).[7] We can also estimate the standard

error of each coefficient.

There is one problem that must ordinarily be dealt with in event history analysis. Some events are censored--that is, the respondent may be interviewed before he has left his current job. Deleting these censored job-person matches from the analysis can be shown to result in serious bias (Sørensen, 1977b; Tuma and Hannan, in press). When they are included in the analysis, the maximum likelihood estimation technique we use leads to estimates that are asymptotically unbiassed and also have very good properties in small samples with moderate degrees of censoring (Tuma and Hannan, in press). This strategy is used here and we believe that no serious bias results from these censored observations, which form only a small fraction of all job-person matches.

4. RESULTS

The first set of results we present pertains to the analysis of shifts from all jobs. Our objective is to estimate transition rates of moves to jobs with higher and lower rewards. The direction of a move is determined by comparing the occupational status of the current job with the status of the next job. This produces three types of events: shifts upward in status, shifts downward, and lateral shifts, which produce no change in status. We choose status as the criterion because it summarizes a number of job rewards and apparently measures the "goodness" of occupations (Goldthorpe and Hope, 1972). An alternative would have been to employ earnings as the criterion for the direction of move. Below we show that it makes very little substantive difference whether one uses status or earnings. However, the analysis based on status gives models

that have somewhat higher explanatory power. Future research will undertake a detailed comparison of earnings and status changes.

The results for lateral moves are presented but not interpreted. They evidently represent a mixture of gains and losses in job rewards other than those summarized by status.

In Table 2 we present results for various models for the transition rates for upward, downward, and lateral moves.[8] The coefficients presented are metric coefficients. We have little interest in comparing the relative magnitude of the effects of different variables within models, and we rely on the significance level to indicate relative importance. In evaluating a model's performance, we use a likelihood ratio test comparing the model to a baseline; this test gives a chi-square value (see note 7, above). The baseline is the model of a constant, homogeneous rate. This criterion is appropriate for comparing different models estimated on the same sample. However, this test does not allow us to compare the performance of identical models in different samples.

Model I has only one independent variable: T_j, the time in the labor force at entry into the origin job j. For both upward and downward moves this model performs significantly better than the baseline model of a constant rate. In both cases the coefficient is negative, though somewhat larger for downward than upward moves. In the case of lateral moves, Model I does not perform better than the baseline model.

The results for Model I are difficult to interpret without information on the performance of models with other independent variables. As

mentioned, one possible interpretation of the effect of T_j in upward moves is that this variable indexes the discrepancy between resources and current job rewards. Model II, which represents this mechanism, shows a dramatic increase over Model I in the chi-square value for upward moves. There is also a more modest increase for downward and lateral moves. The chi-square value depends on the degrees of freedom, which also increase. If we use the chi-square per degree of freedom as a criterion, we find that Model II clearly outperforms Model I for upward moves and, less so, for lateral moves.

Model III reintroduces time in the labor force (T_j) as an independent variable. The increase in the chi-square value over that of Model II is substantial for downward and lateral moves. For upward moves the increase in the chi-square value is only marginally significant ($.02 < p < .05$). This suggests that in upward moves labor force experience at the start of a job is primarily an index of the discrepancy between resources and current job rewards. In downward moves the substantial contribution of this variable to the explanatory power suggests that labor force experience may indeed be a resource in the open-employment relationships expected to generate these moves--consistent with human-capital theory, which has advocated this interpretation of labor force experience and assumes open-employment relationships.

Model IV allows for duration-dependence; we rely on this model for the interpretation of substantive results. For downward moves the addition of duration more than doubles the chi-square value (compare Models III and IV). For lateral moves the improvement is also substantial.

For upward moves, the effect of incorporating duration is much smaller, though statistically significant.

We argued above that downward moves should usually originate in open-employment relationships, and that job shifts in such employment relationships should be less predictable in terms of the information available to us. Though upward moves may originate in both closed and open employment, the higher predictability of upward moves over downward (and lateral) moves (as indicated by the relative sizes of the chi-square values) seems to confirm this prediction.

As indicated earlier, the dependence of the rates of move on duration has several interpretations. It could reflect unmeasured personal resources and job rewards, but this seems to be of only minor importance--otherwise we should see stronger duration-dependence in upward moves. Heterogeneity in the employment relationship--that jobs vary in the incumbent's exposure to the risk of employer-initiated dismissals--is a likely source of duration-dependence. This explanation should not apply to the rate of moves to better jobs. Finally, duration-dependence may reflect protection from dismissal provided by on-the-job training. It does not seem possible to distinguish between these two interpretations with available data. However, both interpretations point to the importance of the employment relationship for downward moves.

It should be mentioned that the training interpretation of the duration effect suggests that the rate of an upward move may increase with duration. The coefficient of duration for an upward move is negative, though small. It is possible that the small negative effect of duration reflects both negative effects of unmeasured heterogeneity and positive

effects of on-the-job training and search, as outlined earlier.

The effects of personal resources and job rewards in Model IV have the predicted sign for upward moves. Labor force experience (T_j) has an insignificant negative effect, confirming that its effect in Model I mainly comes about because it is an index of the discrepancy between resources and rewards. If all employment relationships are open and there are market imperfections, we would have expected the opposite pattern of effects for downward moves. This is not found. Although education has a negative and significant effect on downward moves, and status a positive effect, earnings have a significant negative effect. Further, ability has no effect, while labor force experience has a significant negative effect. The different effect of labor force experience on upward and downward moves suggests that this variable does represent a resource in the open-employment relationships that should generate most downward moves. Overall the pattern of effects suggests that there are indeed qualitative differences in the mechanisms generating upward and downward moves.

We also estimated Models III and IV using earnings changes as the criterion for the direction of moves. Overall the results were quite similar to those in Table 2. However, the chi-square value for upward moves with Model IV was smaller (390.7) than when status was the criterion (538.3). As in Table 2, we also observe strong duration-dependence in downward moves, but not in upward moves.

Interpretation of the results in Table 2 using predictions from the nature of the employment relationship are ambiguous. While open jobs are primarily responsible for downward moves, upward moves can occur in

both open- and closed-employment relationships.

We turn to results for Model IV using our crude indicator of the nature of the employment relationship: the time unit in which the respondent reported his earnings. In Table 3 we present the results of estimating Model IV for two groups of jobs: those where the time unit is hourly, daily, or weekly; and those where it is monthly or yearly. We expect the time unit to reflect the expected length of the employment contract, but of course in a very crude way. We also report the chi-square values for Model III to show the magnitude of the duration effect in the two sectors.

Labor force experience (T_j) has a negative effect on the rate of downward moves in both open and closed sectors, though its effect is only weakly significant in the closed sector. Its effect on the rate of upward moves is slightly positive and insignificant in both sectors. The weak effect of this variable on upward moves suggests that it should not be interpreted as a measure of increased productivity during a person's career.

The rates of upward and downward moves decrease as duration increases in both sectors, but duration-dependence is much stronger in the open sector than in the closed sector. Furthermore, in both sectors duration-dependence is much greater for downward moves than for upward moves. These patterns of duration-dependence may suggest that job-specific training is more important in the open sector than in the closed sector, or that there is more heterogeneity in employment relationships

in the open sector, reflecting the crudeness of our indicator.

We find that in both sectors the effects of ability and education on the rate of the upward moves are significant and positive and that the effects of earnings and status are significant and negative. This is as we expected. At the same time, the effects of ability and education on upward moves are much larger in the closed sector than in the open sector. This difference may indicate that unmeasured personal resources are more important for upward moves in the open sector than in the closed sector. This interpretation is also consistent with the greater duration-dependence in the open sector noted previously.

We argued that downward moves should occur very rarely in the closed sector. Indeed, the constant, homogeneous rate r to worse jobs is .009 (per month), almost half the rate of .017 in the open sector. However, these rates are presumably influenced by the differences in the populations employed in the two sectors. Since the employment relationship is a structural characteristic, we would like to adjust for such population differences. This can be done by multiplying the coefficients for downward moves in Table 3 by the overall means of variables for all job-person matches of the men in the sample. This gives an expected value of the rate of a downward move for an "average" job-person match. We set duration equal to zero to give us this rate at the start of the job. Such a calculation produces a rate of downward move for the open sector of .027, and a rate for the closed sector of .012. This difference supports our argument that, ceteris paribus, downward moves are more likely in open-employment relationships than in closed ones.

Salaried employees tend to be found in white-collar occupations. Hence the differences observed in Table 3 between the open and the closed sector as indicated by the time unit of wages may parallel a difference between white-collar and blue-collar jobs. While blue-collar jobs may be quite uniform with respect to the time unit of a earnings, it is probably the case that these jobs are quite heterogeneous with respect to the employment relationship. An indicator of closed- and open-employment relationship that would differentiate blue-collar jobs is the presence or absence of union membership. In an attempt to demonstrate that blue-collar jobs differ with respect to the employment relationship we present in Table 4 estimates of Model IV in three sectors: white-collar jobs, unionized blue-collar jobs, and nonunionized blue-collar jobs.

We find a great deal of similarity in the patterns of effects of our independent variables in white-collar and unionized blue-collar jobs. Hence closed-employment relationships appear to dominate in these two sectors, as expected. The most noteworthy difference is that duration-dependence is somewhat stronger in unionized blue-collar jobs than in white-collar jobs, possibly reflecting a greater importance of on-the-job training as a protection against dismissals in the blue-collar sector. The difference between white-collar and unionized blue-collar jobs, on the one hand, and nonunionized blue-collar, on the other hand, parallels the differences observed in Table 3. We find much stronger duration-dependence in nonunionized blue-collar jobs, significant also for upward moves. In contrast the effect of ability and education, resources formed at entry into the labor force, is greater in the more closed white-collar

and unionized blue-collar sectors. This pattern can be interpreted as reflecting the greater importance of unmeasured variables for moves in the open, nonunionized blue-collar sector, consistent with hypotheses stated earlier.

The observed and the hypothetical rates of moves down in the white-collar and the unionized blue-collar sector are very similar to each other and much lower than the rates for the nonunionized blue-collar sector. Here the hypothetical rate that adjusts for population differences is .046 in contrast to .017 in the more closed white-collar and unionized blue-collar sectors. Clearly there are important differences in the risk of downward moves between the sectors.

5. CONCLUSION

In this paper we argue that there are fundamental differences among labor markets in the mechanisms that produce change in attainment, that is, in the mechanisms that create the observed association between social and economic attainment and the characteristics of individuals. We argue that one source of the difference is the nature of the employment relationship. In open-employment relationships, persons are exposed to competition from other workers, and the wage competition model of marginal productivity/human capital theory is assumed to prevail. In closed-employment relationships, change in attainment takes place when the person obtains access to a better job that is vacant, and the vacancy competition model should apply. The two models lead to very different interpretations of the attainment process: in the human capital model differences in attainment are directly linked to differences in productivity; in the vacancy competition model, the structure of

opportunities and competitive advantages provided by personal resources like education are important.

Our analysis has attempted to provide evidence for this distinction by analyzing transition rates to jobs that are better or worse than the current job; these rates are assumed to be functions of individual and job characteristics. Downward moves should originate in open-employment relationships as a result of employer-initiated dismissals from jobs. Upward moves should predominate in closed-employment relationships, but may also occur in open relationships because of market imperfections.

We find evidence that different mechanisms govern upward and downward moves. The rate of downward moves is strongly duration-dependent net of other variables. We interpret this to reflect partly the importance of job-specific training for establishing protection from competition and partly the existence of heterogeneity in employment relationships (because some jobs give protection against dismissal, while others do not). Both interpretations support the distinction between closed- and open-employment relationships. Further, we find that labor force experience--the favorite proxy in human capital theory for increased productivity after entry into the labor force--has a significant negative effect on the rate of downward moves, but not on the rate of upward moves. This suggests that labor force experience does not primarily measure increased productivity. In upward moves we find that ability and education have strong positive effects, while earnings and status have strong negative effects, as predicted.

Since upward moves can occur in both open and closed jobs, analysis of upward moves in all jobs provides ambiguous evidence about the nature

of the employment relationship. We constructed two sectors on the basis of time unit of earnings, with a shorter time unit (hourly, weekly, monthly) indicating the open sector and a longer time unit (monthly, yearly) indicating the closed sector. Analysis of upward moves in the two sectors shows that resources formed at entry into the labor force have strong effects on the rate of upward moves in the closed sector, as predicted by the vacancy competition model. In the open sector, unmeasured resource variables, as indicated by a significant duration effect, are more important, reflecting the greater importance of real differences in productivity in the open, competitive sector. We also show that the observed rate of downward moves is higher in the open than in the closed sector. To eliminate the possible importance of differences in resources and rewards in the two sectors for this result, we show that a match with characteristics of an average job and person is exposed to a much higher risk of a downward move in the open sector than in the closed sector. We further show that the difference between the sector can also be established using unionization as an indicator.

In this paper we have barely begun to exhaust the rich possibilities for analysis provided by the causal analysis of transition rates from life (or event) history data. In future research we need to analyze more exhaustively changes in earnings and the combined outcomes of changes in status and earnings. The various interpretations of the duration effects need to be disentangled more conclusively. More refined models should be explored. Substantively the next step is to identify more precisely the occupation-industry categories characterized by closed- and open-employment relationships to carry out actual analysis of the attainment process in these categories.

NOTES

[1]The distinction between job and wage competition suggested by Thurow (1975) is similar to the distinction employed in this paper. Hence the empirical analysis we present attempts to operationalize aspects of Thurow's concept.

[2]An exception to this characteristic of sociological research on attainment is Wright and Perrone's (1977) analysis of income attainment in different social classes from a Marxist perspective.

[3]The concept of closed and open social relations derives from Weber (1947). See Myles and Sørensen (1975) and Sørensen and Kalleberg (1977) for elaborations of this concept in the context of labor markets and mobility.

[4]These ideas are argued at length in Tuma (1976) and given a mathematical specification in Sørensen (1977a).

[5]Plant closings and the like, of course, may force involuntary moves on incumbents of jobs in closed-employment relationships. Furthermore, unemployment in the form of temporary layoffs can occur in closed-employment relationships. Here the worker is unemployed but keeps the right to the job. Spells of unemployment are usually short and the majority do indeed return to their jobs (Feldstein, 1976).

[6]A strict interpretation of human-capital theory does not allow this prediction. However, human-capital theory allowing for market imperfections should give this result. Without controls for current earnings, however, it is dubious whether the pattern will appear.

[7]The likelihood L is defined as the probability of the joint set of observations, that is, assuming independent observations, the product of the probabilities or probability densities predicted by the model. The maximum likelihood estimates are those values of the coefficients in a model that make L largest and the observations most probable, assuming the model is true. Tests of the model rely on the likelihood ratio statistic. Let L_0 and L_1 represent the likelihood of the baseline model (in our applications usually the model that assumes a constant rate) and the given model, respectively. The likelihood ratio λ is defined as the maximum of L_0 divided by the maximum of L_1. It can be shown that $-2 \ln \lambda$ has a chi-square distribution with k degrees of freedom, where k is the number of coefficients in the given model that are fixed at zero in the baseline model.

[8]It should be noted that the transition rate for downward moves is higher than the transition rate for upward moves. This does not mean that overall attainment declines with time in the labor force. In fact, status attainment profiles show the typical pattern of rapid increases in attainment early in a person's career, and less growth and stability later in the career (Sørensen, 1975). This suggests that the duration of a job obtained after a downward move is short. This may be because a person is further from his best possible job or because there is second-order dependence in the attainment process. This issue will be explored in future research.

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Table 1. Variables and their Definitions

Name of Variable	Definition
Ability	Number of correct answers on 10-item word-recognition test. Adjusted for missing values on single items.
Education	Highest grade completed at entry into the job.
Earnings	Mean of reported earnings at the start and end of the job; converted into monthly earnings in dollars; price-index adjusted to 1966 = 100.
Status	Siegel prestige score (Siegel, 1971).
Time in labor force (in years) (T_j)	Calculated from date of entry into labor force to start of job j. Entry into labor force is defined as the date of the first full-time employment lasting 18 months or longer.
Entry date (t_j)	As reported (year and month).
Exit date	As reported (year and month).
Time unit of earnings	Time unit in which earnings were reported by respondents.
Union membership	As reported.

Table 2

Estimates of Models for Transition Rates to Better Jobs, Worse Jobs and Same-Status Jobs (Metric Coefficients)

Variables	Model I	Model II	Model III	Model IV
		Moves Up (r = .0124)		
Ability		.1100***	.1150***	.1052***
Education		.1132***	.1157***	.1074***
Earnings		-.1102***	-.1252***	-.1052***
Status		-.0735***	-.0743***	-.0719***
Time in labor force (T_j)	-.0389***		.0152	.0081
Duration (d_j)				-.1004***
Chi-square	23.86***	496.71***	499.98***	538.32***
df	1			
		Moves Down (r = .0147)		
Ability		.0541*	.0434	.0212
Education		-.0619**	-.0805***	-.0926***
Earnings		-.1506***	-.1021***	-.0768***
Status		.0034	.0061	.0086**
Time in labor force (T_j)	-.0553***		-.0434	-.0535***
Duration (d_j)				-.2376**
Chi-square	55.29***	88.79***	116.90***	306.30***
		Lateral Moves (r = .0099)		
Ability		.0786**	.0894**	.0775**
Education		.0444*	.0596**	.0511*
Earnings		-.0835***	-.1197***	-.1048***
Status		.0038	.0017	.0027
Time in labor force (T_j)	.0159		.0375***	.0283**
Duration (d_j)				-.1268***
Chi-square	3.49	42.60***	58.48***	100.94***

N = 2295 job-person matches

Note: For definitions of variables, see Table 1. For definitions of models, see Figure 1. Rates are measured with months as units. Coefficients to T and t are given in years as units, and coefficients to earnings in $100's.

* $.01 < p \leq .05$ ** $.001 < p \leq .01$ *** $p < .001$

Table 3

Estimates of Model IV in Closed- and Open-Employment Relationships when Index of Employment Relationships is Time Unit of Wages

Variable	Direction of Move			
	Open sector[a]		Closed sector[b]	
	Up	Down	Up	Down
Ability	.0874**	.0294	.1658**	.0129
Education	.1004***	-.0648**	.1755***	-.1281**
Wage	-.1066***	-.0464	-.1312**	-.1280**
Status	-.0730***	.0127***	-.0709***	.0201**
Time in labor force (T_j)	.0076	-.0566***	.0234	-.0415*
Duration (d_j)	-.1174***	-.2735***	.0261	-.1091**
Chi-square - Model IV	380.92***	238.83***	95.38***	48.70***
Chi-square - Model III	341.27***	62.28***	94.82***	37.66***
Observed rate of move down	.017		.009	
Hypothetical rate of move down[c]	.027		.012	

[a] N = 1707. Time unit is hourly, daily, or weekly.

[b] N = 559. Time unit is monthly.

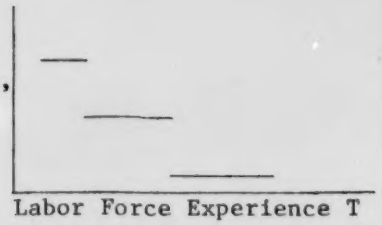
[c] See text for definition of hypothetical rate.

Table 4

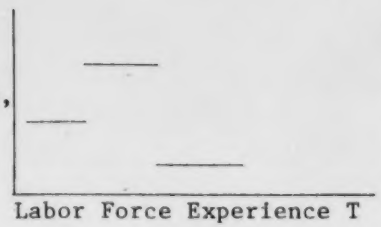
Estimates of Model IV in White-Collar Jobs, Unionized Blue-Collar Jobs, and Nonunionized Blue-Collar Jobs

	Direction of Move					
	White-collar jobs (N=747)		Unionized blue-collar jobs (N=449)		Nonunionized blue-collar jobs (N=1085)	
Variable	Up	Down	Up	Down	Up	Down
Ability	.1571***	-.0318	.1338	.0812	.0716*	.0483
Education	.1543***	-.1497***	.1394**	-.1204	.0891***	-.0255
Earnings	-.1735**	-.1302**	-.1478*	-.0981	-.0193	-.0549
Status	-.0694***	.0211**	-.0841***	.0191*	-.0832***	.0231***
Time in labor force (T_j)	.0202	-.0624***	.0332	-.0703***	.0046	-.0435***
Duration (d_j)	-.0621	-.1073***	-.0446	-.2351***	-.1390***	-.3294***
Chi-square	142.29***	85.99***	91.90***	60.92***	248.91***	174.39***
Observed rate of move down	.0113		.0122		.0201	
Hypothetical rate of move down	.0171		.0174		.0464	

Model I $r_{jk}(t) = \exp(b_0 + b_1 T_j)$

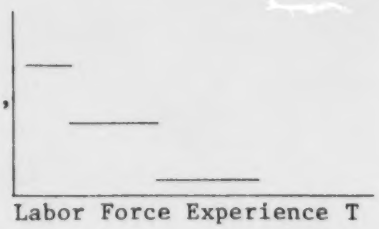


Model II $r_{jk}(t) = \exp(\underline{\alpha}_1 \underline{X} + \underline{\alpha}_2 \underline{Y}_j)$



OR

Model III $r_{jk}(t) = \exp(\underline{\alpha}_1 \underline{X}_1 + \underline{\alpha}_2 \underline{Y}_j + b_1 T_j)$



Model IV $r_{jk}(t) = \exp(\underline{\alpha}_1 \underline{X}_i + \underline{\alpha}_2 \underline{Y}_j + b_1 T_j + \gamma d_j)$

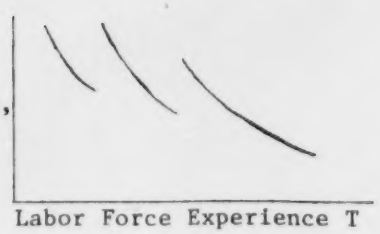


Figure 1. Illustrations of Rate Models. (See text for definition of symbols.)